Heat and Mass transfer - Course Syllabus

Course Number: ME242

Course Title: Heat and Mass transfer

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan 24, 2016	**Semester End Date:**	May 19, 2016

Class Schedule: su & th, 9:00-10:30

Classroom Number:

Instructor(s) Name(s): Roberts
Email: william.roberts@kaust.edu.sa

Office Location: 4221 Al Kindi West
Office Hours: Mon & Wed, 8:30-10:00
Teaching Assistant name:
Email:

COURSE DESCRIPTION FROM PROGRAM GUIDE

Prerequisite: Undergraduate thermodynamics, AMCS 201 (may be taken concurrently). Transport properties, conservation equations, conduction heat transfer, forced and natural convective heat and momentum transfer in laminar and turbulent flows, thermal radiation, mass diffusion.

COMPREHENSIVE COURSE DESCRIPTION

What is heat transfer? Thermal energy in transit due to a temperature gradient

Motivation: Understand rates and modes of heat transfer; ability to design heat systems; understand mass transport; use computational tools to solve heat transfer problems

Example Applications: Energy-conversion devices (engines, fuel cells, turbines), combustion, integrated circuits, human biology

GOALS AND OBJECTIVES

a. Solve steady one-dimensional heat transfer problems analytically

b. Use provided software to numerically solve two dimensional and transient heat conduction problems

c. Use resistance method to approximate solutions to complex geometries

d. Calculate thermal and viscous boundary layer thicknesses for laminar and turbulent flows

e. Calculate radiative heat fluxes between surfaces of simple geometries

f. Calculate gradient driven species mass fluxes

REQUIRED KNOWLEDGE

Undergraduate thermodynamics, undergraduate heat transfer

REFERENCE TEXTS

a. Heat Transfer by Nellis, Klein

b. Reference Texts

i. Heat Transfer by A.F. Mills

ii. Fundamentals of Heat and Mass Transfer by Incropera, DeWitt, Bergman, Lavine

c. Software Used

i. Engineering Equation Solver (EES)

ii. Finite element heat transfer (FEHT)

iii. Maple

iv. MATLAB

d. Handouts, assignments, and course announcements will be available via Blackboard

METHOD OF EVALUATION

Graded content
Homework = 20% Group project = 15% Midterm = 25% Final = 40% Collaborative discussion on homework is encouraged, but each student must do his/her own work.

COURSE REQUIREMENTS

Assignments

Week 1: Steady 1-D conduction, Ch 1
Week 2: Steady 2-D conduction, Ch 2
Week 3: continuation of steady 2-D conduction
Week 4: Unsteady conduction, Ch 3
Week 5: Forced convection, Ch 4 and Midterm
Week 6: continuation of Forced Convection, Ch 5
Week 7: completion of Forced Convection, Ch 5
Week 8: Natural convection, Ch 6
Week 9: Attend Extreme Combustion workshop and report out on assigned topic
Week 10: Heat Exchangers, Ch 8 (course project)
Week 11: Radiation, Ch 10
Week 12: continuation of Radiation
Week 13: Mass transfer, course notes
Week 14: continuation of mass transfer, Stephan problem.
Week 15: Group presentations

Course Policies

Course attendance will not be taken, but active participation is expected. Late work will be accepted, but discounted 10% each day beyond the due date.

Additional Information

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.